

2015

Using the Past to Restore the Future: Quantifying Historical Vegetation to Assist in Tidal Freshwater Wetland Restoration

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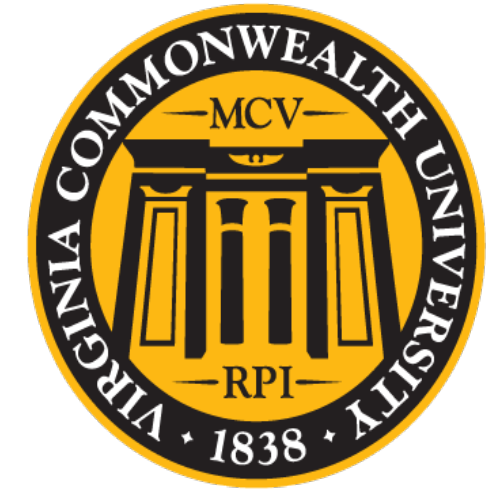
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Using the past to restore the future: Quantifying historical vegetation to assist in tidal freshwater wetland restoration

Former Lake Charles at the VCU Rice Rivers Center

Christopher D. Gatens and Edward R. Crawford, Ph.D.



VCU



Background

Wetlands have been providing humans with critical natural ecosystem services throughout our time on Earth. Nevertheless, these invaluable ecosystems have been habitually altered as a cost of human progression. Two of the most common alterations to wetlands are hydrologic, in the form of damming, and filling. Both occurred along Kimages Creek in Charles City County, VA during the 19th and 20th centuries. In 2010 the Lake Charles dam was partially removed, restoring the creek's tidal communication with the James River and beginning tidal forested freshwater wetland restoration. Upon the recession of the body of water, numerous woody stumps were revealed.

Objectives:

We studied these stump remnants in an attempt to assess the spatial structure and vegetative community of this forested freshwater tidal wetland before perturbation.



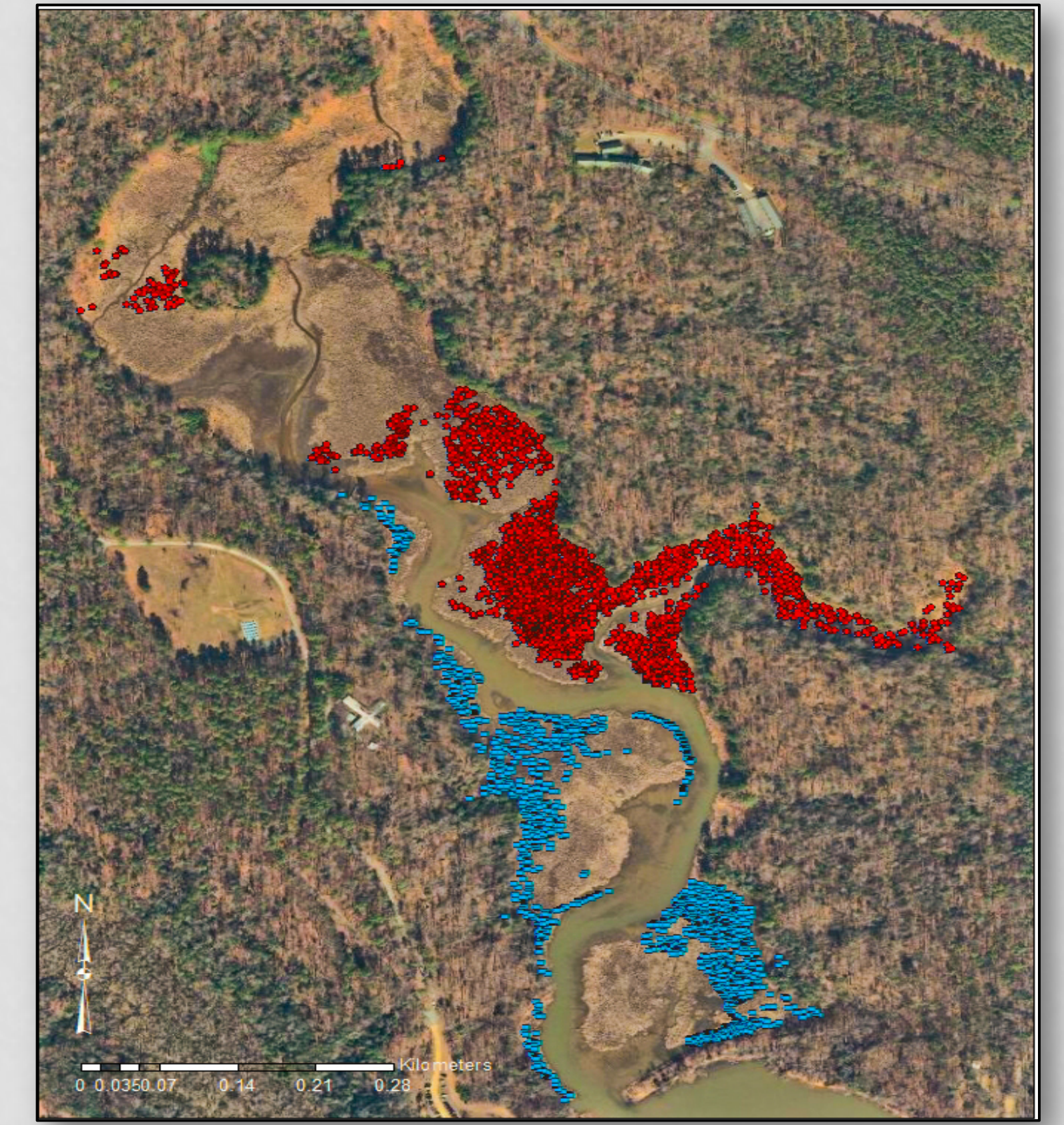
Picture of the Kimages Creek wetland under Union occupation during the Civil War (Egghart 2009)



Present day photo of the Kimages Creek wetland. Photo credit: Rick Ward

Results/Discussion

During this ongoing study, over 4,500 stumps have been geo-located and 413 samples have been processed. There were 11 unique genera identified, among which 15 were identified to the species. The most abundant genus of trees was *Fraxinus* spp. with a relative density of 73.24%, and the next most abundant was *Carya* spp. with a relative density of 11.79%. The remaining samples were comprised of small densities of various species. The majority of the samples were of obligate or facultative wetland species (63.1%).



Geospatial Points:
n~4,546

Stump "cookies":
413 total
258 identified
156 age-identified

Historical Forest Analysis (to date):
11 genera; 15 species
Most abundant: *Fraxinus* spp. (RD=73%)
Age range: 10-102 yr

We will soon compile the geospatial coordinates onto a GIS map and use the species data to better understand the native community. Recreating the natural historical vegetative community could help guide current restoration efforts in other locations in other mid-Atlantic formally impounded wetlands. Ultimately our goal is to be able to build a functioning virtual wetland model.

Works Cited

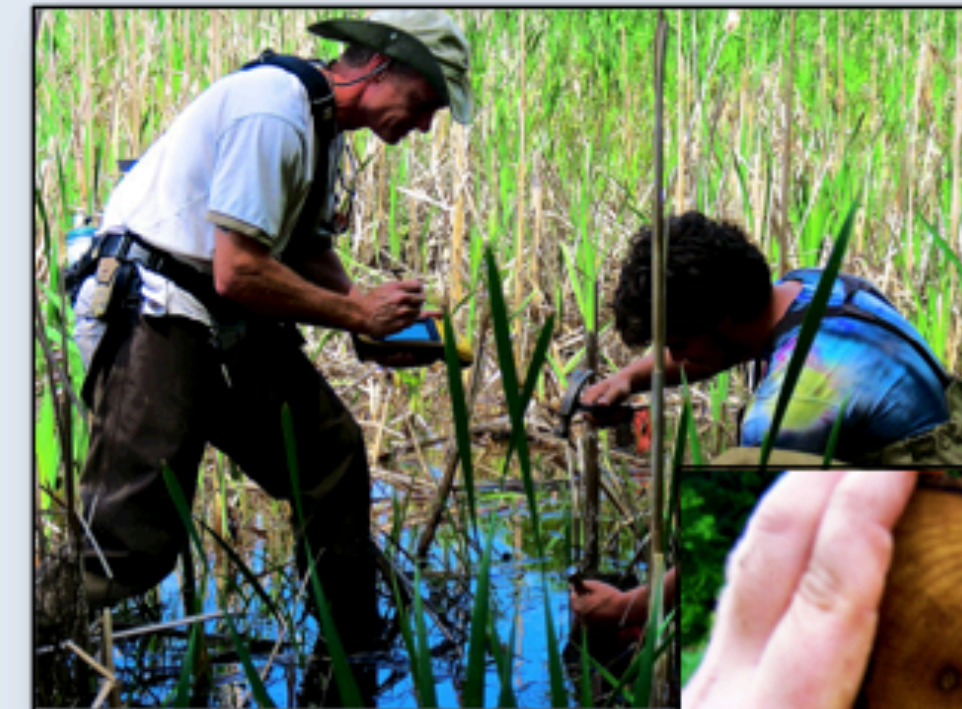
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Acknowledgements

Thanks to James Deemy, Rick Ward (for the pictures, too), Will Schuart, and the VCU Rice Rivers Center for their continued work and support on this project over the years. Thanks to Dr. Crawford for letting me use some of his pictures, but mostly for giving me and countless others this incredible opportunity. Much thanks to all students, graduate and undergraduate, that have worked on this (sometimes arduous) project over the years.

Methods

Obtain geospatial points

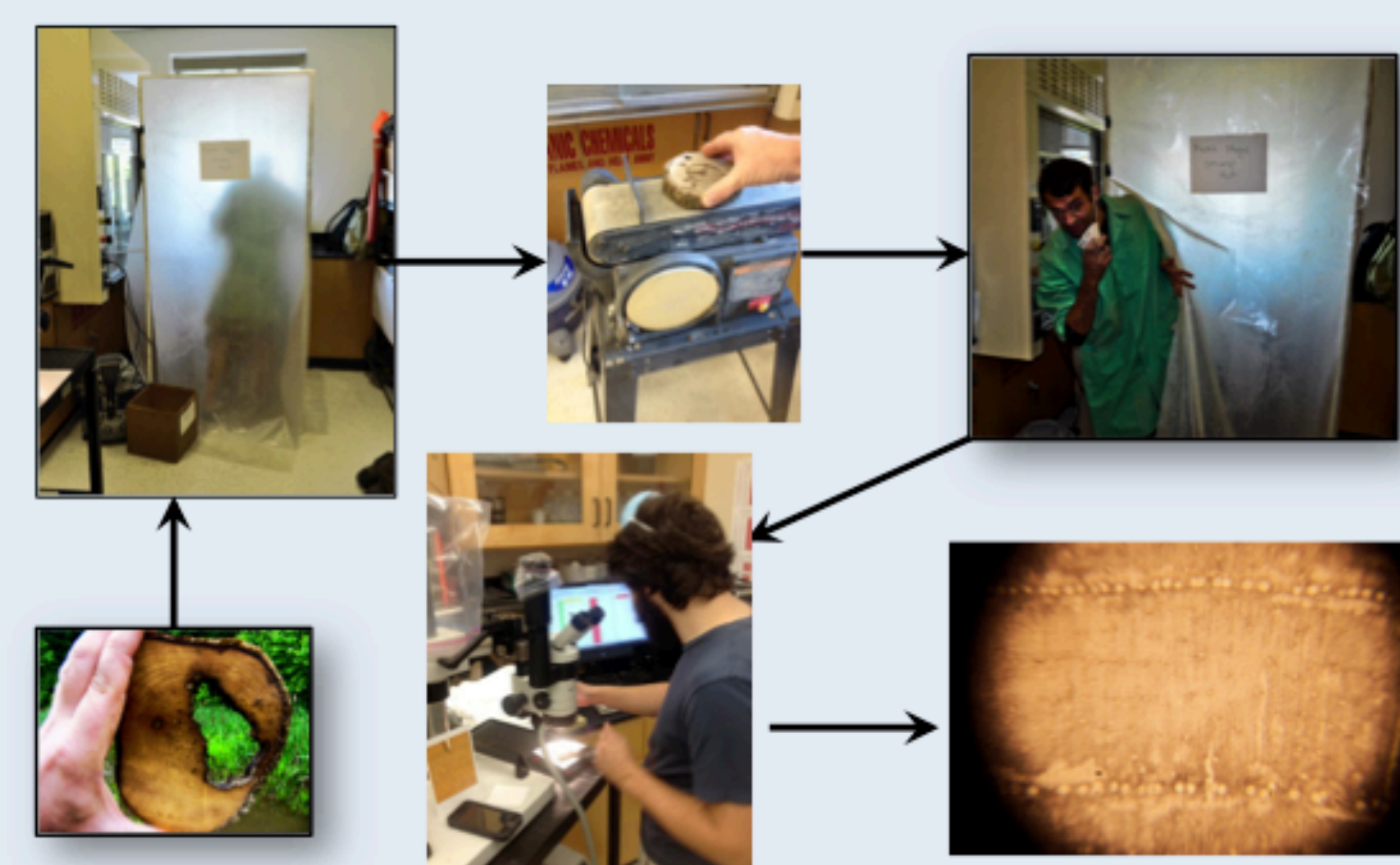


Obtain stump "Cookie"

1) We began by obtaining the geospatial location of each discovered stump with a handheld GPS unit. Every 10 stumps we took a cross-sectional wood sample using a handsaw (a stump "cookie").

"Cookie" Processing & Analyses

Magic Stump Hut



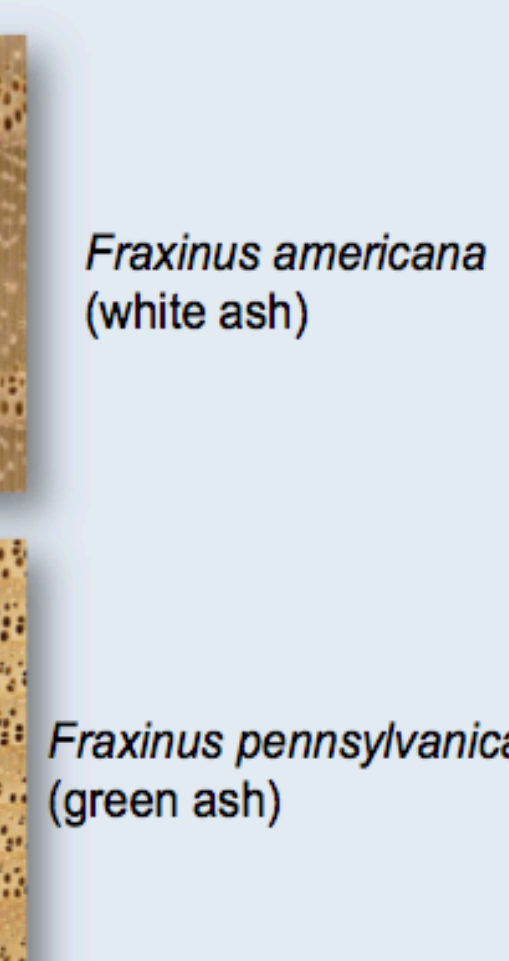
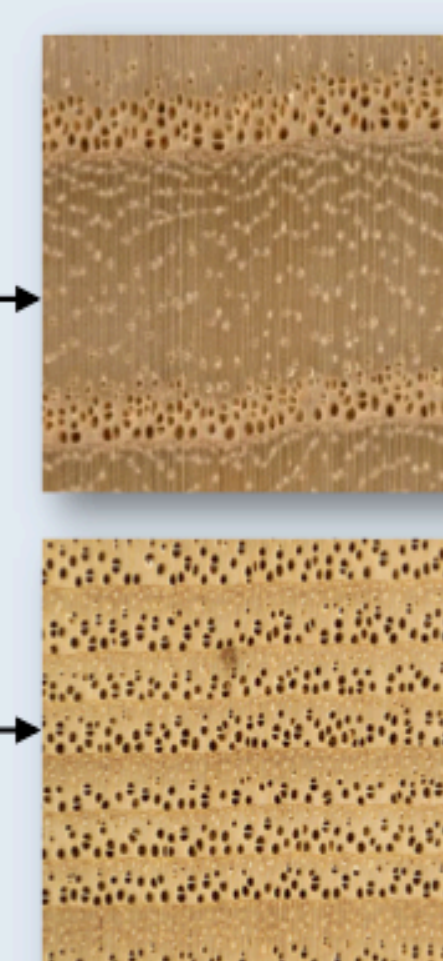
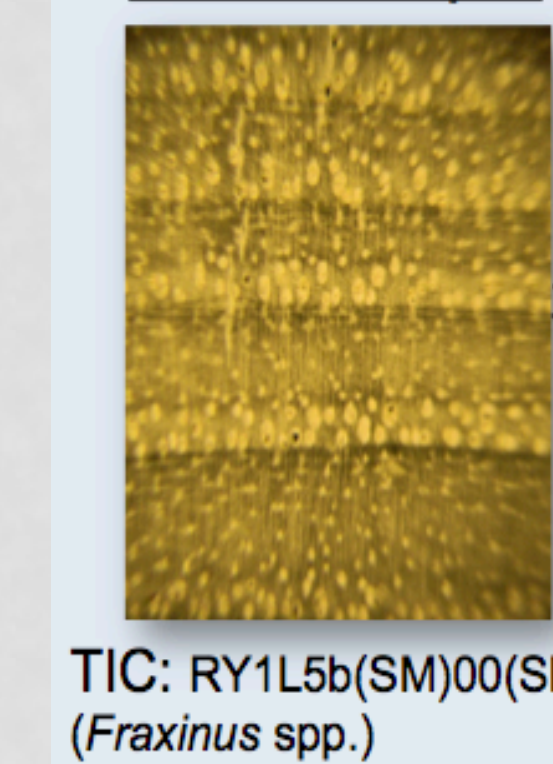
Microscopic Analysis

2) In the lab we first sanded the stumps for easier microscopic analysis. We then used microscopy and a Taxonomic Identification Code process. This process yields a unique alphanumeric code (a TIC), each of which corresponds to a certain species or genus of tree.

3) The Taxonomic Identification Process

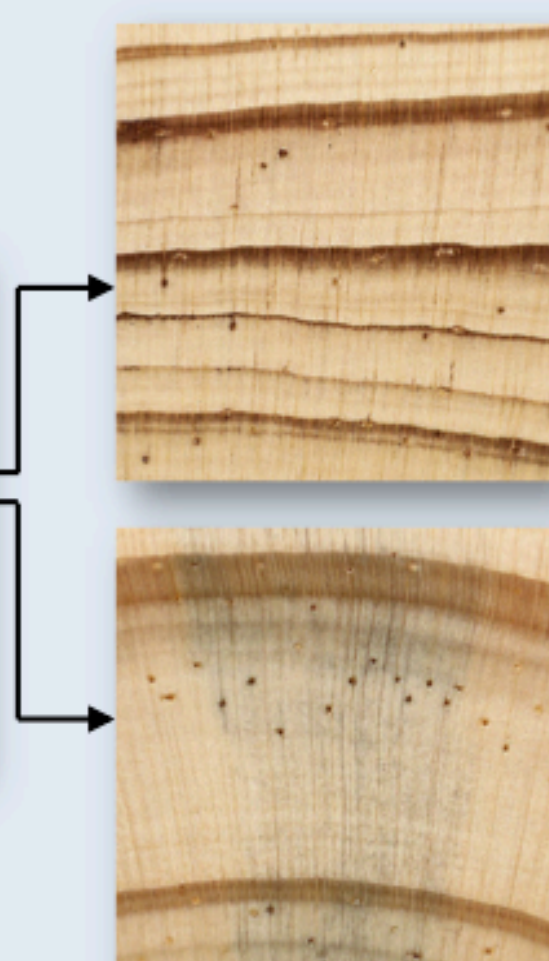
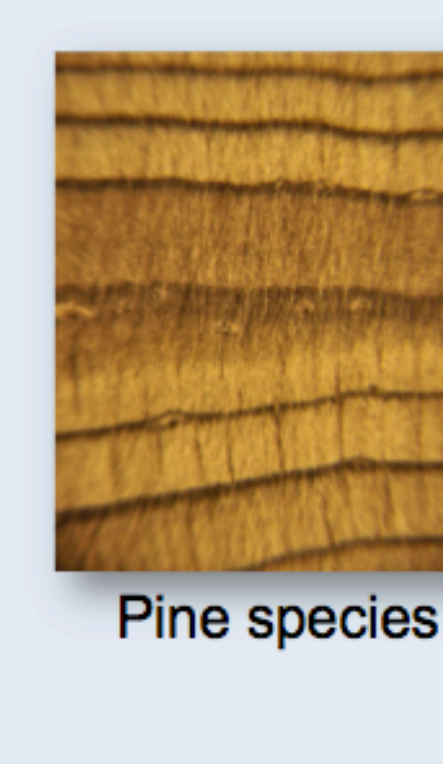
	Diagnostic characteristics	TIC	Latewood Diagnostics		TIC
Step 1	Ring-porous	R	Step 7	Width between uniseriate rays > average latewood pore width	G
	Semi-ring porous	S		Width between uniseriate rays = average latewood pore width	E
	Diffuse-porous	D		Width between uniseriate rays < average latewood pore width	L
Step 2	Visible [≤10X] growth rings	Y	Step 8	Even distribution	1
	Microscopic (>10X) growth rings	N		Uneven distribution	2
Step 3	Uniseriate rays	1	Step 9	Solitary pores	S
	Multiseriate rays	2		Multiple pores	M
Step 4	Distinct uniseriate rays (<10X)	E		Chain pores	
	Indistinct uniseriate rays (≈10X)	L			
	Microscopic uniseriate rays >10X	M			
Earlywood Diagnostics				Nested pores	N
Step 5	Minute pores, single row, intermittently spaced	1		Wavy pores (uniform)	W
	Small pores, 2 to 4 pores wide, adjacently arranged	2		Step 10	Continuous "lines" run parallel to growth rings connecting pores and uniseriate rays
	Large pores, 1 – 2 pores wide, intermittently spaced	3	Intermittent horizontal/wavy lines connecting latewood pores		4
	Large pores, 1 – 2 pores wide, adjacently arranged	4	Two previous characteristics are absent		
	Large pores, 2 – 4 pores wide, adjacently arranged	5a		Step 11	Growth rings are defined by a continuous "line" of pores
	Large pores, 2 – 4 pores wide, intermittently spaced	5b	Growth rings are definable bands of parenchyma cells		L
	Large pores, 3 – 8 pores in width	6			Growth rings are neither comprised of pores or definable bands of parenchyma cells
Step 6	Solitary pores	5			
	Multiple pores	M			

Cookie Analyses (Hardwoods) Field sample



TIC: RY1L5b(SM)00(SMC) (Fraxinus spp.)

Cookie Analyses (Softwoods) Field sample



Pinus serotina (pond pine)

Pinus taeda (loblolly pine)